

EXHIBIT A
PENDING CLAIMS AFTER ENTRY OF THE
AMENDMENT FILED JULY 19, 2002
U.S. PATENT APPLICATION SERIAL NO. 09/079,678

75. A method of delivering a drug to a subject comprising administering to the subject a therapeutically effective amount of a pharmaceutical composition comprising a therapeutically effective amount of a nucleic acid encoding a chimeric protein comprising (i) a first protein comprising at least 6 contiguous amino acids of an amino acid sequence selected from the group consisting of SEQ ID NOS:1-55, said contiguous amino acids being capable of specifically binding to a gastro-intestinal receptor selected from the group consisting of HPT1 (SEQ ID NO:178), hPEPT1 (SEQ ID NO:176), D2H (SEQ ID NO:179), and hSI (SEQ ID NO:181), said first protein being fused via a covalent bond to a second protein being a drug; and a pharmaceutically acceptable carrier.

109. A method of delivering an active agent in vivo comprising administering to a subject a composition comprising a purified protein which specifically binds a gastro-intestinal tract receptor, which receptor is selected from the group consisting of HPT1 (SEQ ID NO:178), hPEPT1 (SEQ ID NO:176), D2H (SEQ ID NO:179), and hSI (SEQ ID NO:181), wherein the purified protein is bound to a material comprising an active agent, said active agent being of value in the treatment of a mammalian disease or disorder, and wherein the protein is selected from the group consisting of

- (a) a protein comprising an amino acid sequence selected from the group consisting of SEQ ID NOS:1-55 or a binding portion thereof;
- (b) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Xaa₁ Thr Xaa₂ Xaa₃ Ser Xaa₄ Xaa₅ Xaa₆ Asn Xaa₇ Arg (SEQ ID NO:253), where Xaa₁ is Ser or Thr; Xaa₂ is Arg or Lys; Xaa₃ is Lys or Arg; Xaa₄ is Ser or Leu; Xaa₅ is Arg, Ile, Val, or Ser; Xaa₆ is Ser, Tyr, Phe, or His; and Xaa₇ is Pro, His or Arg;
- (c) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence

of: Asp Xaa₁ Asp Xaa₂ Arg Arg Xaa₃ Xaa₄ (SEQ ID NO:254) where Xaa₁ is Ser, Ala, or Gly; Xaa₂ is Val or Gln; Xaa₃ is Pro, Gly, or Ser; and Xaa₄ is Trp or Tyr;

- (d) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Val Arg Ser Gly Cys Gly Xaa₁ Xaa₂ Ser Ser (SEQ ID NO:255), where Xaa₁ is Ala or Phe; and Xaa₂ is Arg or His;
- (e) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: NTRKSSRSNPR (SEQ ID NO:256);
- (f) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: STKRSLIYNHR (SEQ ID NO:257);
- (g) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: STGRKVFNRR (SEQ ID NO:258);
- (h) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: TNAKHSSHNR (SEQ ID NO:259);
- (i) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: DSDVRRPW (SEQ ID NO:260);
- (j) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: AADQRRGW (SEQ ID NO:261);
- (k) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: DGRGGRSY (SEQ ID NO:262);

- (l) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: RVRS (SEQ ID NO:263);
- (m) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: SVRSGCGFRGSS (SEQ ID NO:264); and
- (n) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: SVRGGCGAHSS (SEQ ID NO:265).

110. The method of claim 109 wherein the protein comprises an amino acid sequence selected from the group consisting of SEQ ID NOS:1-55 or a binding portion thereof.

111. The method of claim 109 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Xaa₁ Thr Xaa₂ Xaa₃ Ser Xaa₄ Xaa₅ Xaa₆ Asn Xaa₇ Arg (SEQ ID NO:253), where Xaa₁ is Ser or Thr; Xaa₂ is Arg or Lys; Xaa₃ is Lys or Arg; Xaa₄ is Ser or Leu; Xaa₅ is Arg, Ile, Val, or Ser; Xaa₆ is Ser, Tyr, Phe, or His; and Xaa₇ is Pro, His or Arg.

112. The method of claim 109 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Asp Xaa₁ Asp Xaa₂ Arg Arg Xaa₃ Xaa₄ (SEQ ID NO:254) where Xaa₁ is Ser, Ala, or Gly; Xaa₂ is Val or Gln; Xaa₃ is Pro, Gly, or Ser; and Xaa₄ is Trp or Tyr.

113. The method of claim 109 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Val Arg Ser Gly Cys Gly Xaa₁ Xaa₂ Ser Ser (SEQ ID NO:255), where Xaa₁ is Ala or Phe; and Xaa₂ is Arg or His.

114. The method of claim 109 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: NTRKSSRSNPR (SEQ ID NO:256) or STKRSLIYNHR (SEQ ID NO:257) or STGRKVFNRR (SEQ ID NO:258) or TNAKHSSHNR (SEQ ID NO:259).

115. The method of claim 109 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: DSDVRRPW (SEQ ID NO:260) or AADQRRGW (SEQ ID NO:261) or DGRGGRSY (SEQ ID NO:262).

116. The method of claim 109 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: RVRS (SEQ ID NO:263) or SVRSGCGFRGSS (SEQ ID NO:264) or SVRGGCGAHSS (SEQ ID NO:265).

117. The method of claim 109 wherein the material is a particle containing the active agent.

118. The method of claim 109 wherein the active agent is a drug.

119. The method as in any one of claims 110-118 wherein the protein is not more than 40 amino acids in length.

120. The method as in any one of claims 110-118 wherein the protein is not more than 30 amino acids in length.

121. The method as in any one of claims 110-118 wherein the protein is not more than 20 amino acids in length.

122. The method as in any one of claims 110-118 wherein said composition facilitates the transport of the active agent through human or animal gastro-intestinal tissue.

123. The method as in any one of claims 110-118, in which the administering is oral.

124. The method as in any one of claims 110-118, in which the active agent is a drug.

125. The method as in any one of claims 110-118, in which the subject is human.

126. The method of claim 124, in which the subject is human.

127. A method of delivering a drug to a subject comprising administering to the subject a composition comprising a purified protein which specifically binds a gastro-intestinal tract receptor, which receptor is selected from the group consisting of HPT1 (SEQ ID NO:178), hPEPT1 (SEQ ID NO:176), D2H (SEQ ID NO:179), and hSI (SEQ ID NO:181), wherein the purified protein is covalently bound to a particle containing a drug of value in the treatment of a mammalian disease or disorder, and wherein the protein is selected from the group consisting of

- (a) a protein comprising an amino acid sequence selected from the group consisting of SEQ ID NOS:1-55 or a binding portion thereof;
- (b) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Xaa₁ Thr Xaa₂ Xaa₃ Ser Xaa₄ Xaa₅ Xaa₆ Asn Xaa₇ Arg (SEQ ID NO:253), where Xaa₁ is Ser or Thr; Xaa₂ is Arg or Lys; Xaa₃ is Lys or Arg; Xaa₄ is Ser or Leu; Xaa₅ is Arg, Ile, Val, or Ser; Xaa₆ is Ser, Tyr, Phe, or His; and Xaa₇ is Pro, His or Arg;
- (c) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence

of: Asp Xaa₁ Asp Xaa₂ Arg Arg Xaa₃ Xaa₄ (SEQ ID NO:254) where Xaa₁ is Ser, Ala, or Gly; Xaa₂ is Val or Gln; Xaa₃ is Pro, Gly, or Ser; and Xaa₄ is Trp or Tyr;

- (d) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Val Arg Ser Gly Cys Gly Xaa₁ Xaa₂ Ser Ser (SEQ ID NO:255), where Xaa₁ is Ala or Phe; and Xaa₂ is Arg or His;
- (e) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: NTRKSSRSNPR (SEQ ID NO:256);
- (f) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: STKRSLIYNHR (SEQ ID NO:257);
- (g) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: STGRKVFNRR (SEQ ID NO:258);
- (h) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: TNAKHSSHNR (SEQ ID NO:259);
- (i) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: DSDVRRPW (SEQ ID NO:260);
- (j) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: AADQRRGW (SEQ ID NO:261);
- (k) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: DGRGGRSY (SEQ ID NO:262);

- (l) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: RVRS (SEQ ID NO:263);
- (m) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: SVRSGCGFRGSS (SEQ ID NO:264); and
- (n) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: SVRGGCGAHSS (SEQ ID NO:265).

128. The method of claim 127 wherein the protein comprises an amino acid sequence selected from the group consisting of SEQ ID NOS:1-55 or a binding portion thereof.

129. The method of claim 127 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Xaa₁ Thr Xaa₂ Xaa₃ Ser Xaa₄ Xaa₅ Xaa₆ Asn Xaa₇ Arg (SEQ ID NO:253), where Xaa₁ is Ser or Thr; Xaa₂ is Arg or Lys; Xaa₃ is Lys or Arg; Xaa₄ is Ser or Leu; Xaa₅ is Arg, Ile, Val, or Ser; Xaa₆ is Ser, Tyr, Phe, or His; and Xaa₇ is Pro, His or Arg.

130. The method of claim 127 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Asp Xaa₁ Asp Xaa₂ Arg Arg Xaa₃ Xaa₄ (SEQ ID NO:254) where Xaa₁ is Ser, Ala, or Gly; Xaa₂ is Val or Gln; Xaa₃ is Pro, Gly, or Ser; and Xaa₄ is Trp or Tyr.

131. The method of claim 127 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Val Arg Ser Gly Cys Gly Xaa₁ Xaa₂ Ser Ser (SEQ ID NO:255), where Xaa₁ is Ala or Phe; and Xaa₂ is Arg or His.

132. The method of claim 127 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: NTRKSSRSNPR (SEQ ID NO:256) or STKRSLIYNHR (SEQ ID NO:257) or STGRKVFNRR (SEQ ID NO:258) or TNAKHSSHNR (SEQ ID NO:259).

133. The method of claim 127 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: DSDVRRPW (SEQ ID NO:260) or AADQRRGW (SEQ ID NO:261) or DGRGGRSY (SEQ ID NO:262).

134. The method of claim 127 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: RVRS (SEQ ID NO:263) or SVRSGCGFRGSS (SEQ ID NO:264) or SVRGGCGAHSS (SEQ ID NO:265).

135. The method as in any one of claims 128-134 wherein the protein is not more than 40 amino acids in length.

136. The method as in any one of claims 128-134 wherein the protein is not more than 30 amino acids in length.

137. The method as in any one of claims 128-134 wherein the protein is not more than 20 amino acids in length.

138. The method as in any one of claims 128-134 wherein said composition facilitates the transport of the drug through human or animal gastro-intestinal tissue.

139. The method as in any one of claims 128-134 in which the administering is oral.

140. The method as in any one of claims 128-134 in which the subject is a human.

141. A method of delivering a drug to a subject comprising administering to the subject a composition comprising a purified protein which specifically binds a gastrointestinal tract receptor, which receptor is selected from the group consisting of HPT1 (SEQ ID NO:178), hPEPT1 (SEQ ID NO:176), D2H (SEQ ID NO:179), and hSI (SEQ ID NO:181), wherein the purified protein is covalently bound to a drug of value in the treatment of a mammalian disease or disorder, and wherein the protein is selected from the group consisting of

- (a) a protein comprising an amino acid sequence selected from the group consisting of SEQ ID NOS:1-55 or a binding portion thereof;
- (b) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Xaa₁ Thr Xaa₂ Xaa₃ Ser Xaa₄ Xaa₅ Xaa₆ Asn Xaa₇ Arg (SEQ ID NO:253), where Xaa₁ is Ser or Thr; Xaa₂ is Arg or Lys; Xaa₃ is Lys or Arg; Xaa₄ is Ser or Leu; Xaa₅ is Arg, Ile, Val, or Ser; Xaa₆ is Ser, Tyr, Phe, or His; and Xaa₇ is Pro, His or Arg;
- (c) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Asp Xaa₁ Asp Xaa₂ Arg Arg Xaa₃ Xaa₄ (SEQ ID NO:254) where Xaa₁ is Ser, Ala, or Gly; Xaa₂ is Val or Gln; Xaa₃ is Pro, Gly, or Ser; and Xaa₄ is Trp or Tyr;
- (d) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Val Arg Ser Gly Cys Gly Xaa₁ Xaa₂ Ser Ser (SEQ ID NO:255), where Xaa₁ is Ala or Phe; and Xaa₂ is Arg or His;
- (e) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: NTRKSSRSNPR (SEQ ID NO:256);

- (f) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: STKRSLIYNHR (SEQ ID NO:257);
- (g) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: STGRKVFNRR (SEQ ID NO:258);
- (h) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: TNAKHSSHNR (SEQ ID NO:259);
- (i) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: DSDVRRPW (SEQ ID NO:260);
- (j) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: AADQRRGW (SEQ ID NO:261);
- (k) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: DGRGGRSY (SEQ ID NO:262);
- (l) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: RVRS (SEQ ID NO:263);
- (m) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: SVRSGCGFRGSS (SEQ ID NO:264); and
- (n) a protein which is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: SVRGGCGAHSS (SEQ ID NO:265).

142. The method of claim 142 wherein the protein comprises an amino acid sequence selected from the group consisting of SEQ ID NOS:1-55 or a binding portion thereof.

143. The method of claim 142 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Xaa₁ Thr Xaa₂ Xaa₃ Ser Xaa₄ Xaa₅ Xaa₆ Asn Xaa₇ Arg (SEQ ID NO:253), where Xaa₁ is Ser or Thr; Xaa₂ is Arg or Lys; Xaa₃ is Lys or Arg; Xaa₄ is Ser or Leu; Xaa₅ is Arg, Ile, Val, or Ser; Xaa₆ is Ser, Tyr, Phe, or His; and Xaa₇ is Pro, His or Arg.

144. The method of claim 142 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Asp Xaa₁ Asp Xaa₂ Arg Arg Xaa₃ Xaa₄ (SEQ ID NO:254) where Xaa₁ is Ser, Ala, or Gly; Xaa₂ is Val or Gln; Xaa₃ is Pro, Gly, or Ser; and Xaa₄ is Trp or Tyr.

145. The method of claim 142 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: Val Arg Ser Gly Cys Gly Xaa₁ Xaa₂ Ser Ser (SEQ ID NO:255), where Xaa₁ is Ala or Phe; and Xaa₂ is Arg or His.

146. The method of claim 142 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: NTRKSSRSNPR (SEQ ID NO:256) or STKRSLIYNHR (SEQ ID NO:257) or STGRKVFNRR (SEQ ID NO:258) or TNAKHSSHNR (SEQ ID NO:259).

147. The method of claim 142 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: DSDVRRPW (SEQ ID NO:260) or AADQRRGW (SEQ ID NO:261) or DGRGGRSY (SEQ ID NO:262).

148. The method of claim 142 wherein the protein is not more than 50 amino acids in length and includes, positioned anywhere along its sequence, the contiguous amino acid sequence of: RVRS (SEQ ID NO:263) or SVRSGCGFRGSS (SEQ ID NO:264) or SVRGGCGAHSS (SEQ ID NO:265).

149. The method as in any one of claims 143-149 wherein the protein is not more than 40 amino acids in length.

150. The method as in any one of claims 143-149 wherein the protein is not more than 30 amino acids in length.

151. The method as in any one of claims 143-149 wherein the protein is not more than 20 amino acids in length.

152. The method as in any one of claims 143-149 wherein said composition facilitates the transport of the drug through human or animal gastro-intestinal tissue.

153. The method as in any one of claims 143-149 in which the administering is oral.

154. The method as in any one of claims 143-149 in which the subject is a human.

155. (New) The method of claim 75, wherein the first protein comprises at least 10 contiguous amino acids of an amino acid sequence selected from the group consisting of SEQ ID NOS:1-55.